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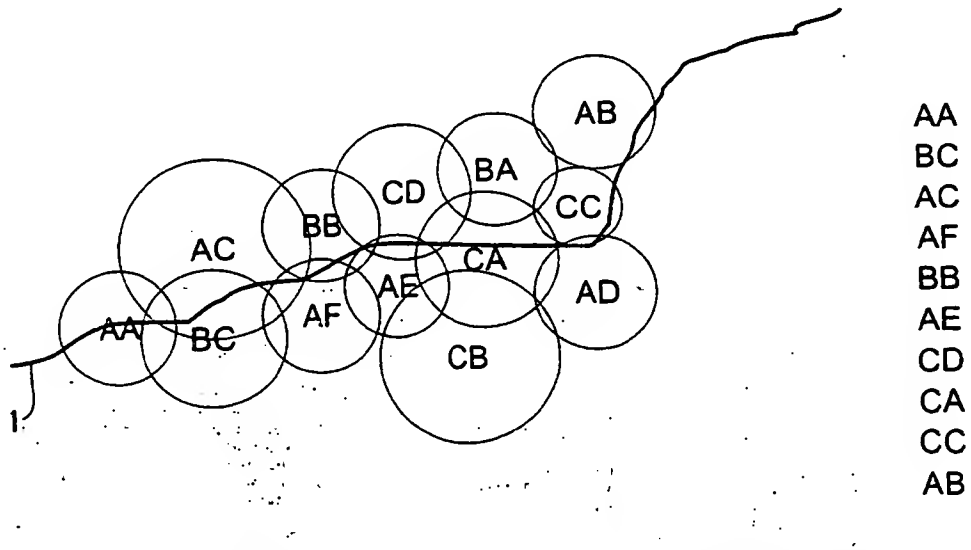
(54) Title: TRAFFIC MONITORING METHOD



(57) Abstract: A method of monitoring road traffic comprises monitoring transitions of mobile telephones between cells (AA, BC, AC, AF,...) of a mobile telephone network. The transitions are correlated to movement of road traffic along highways (1) passing through the cells (AA, BC, AC, AF,...).

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Title: TRAFFIC MONITORING METHOD

This invention relates to the monitoring of traffic flow along highways.

As congestion on roads, due to ever-increasing volumes of traffic, becomes increasingly prevalent the use of systems for the monitoring of traffic flow, and the dissemination of such information to road users, becomes more and more desirable. Known systems for such purposes comprise cameras or other sensors installed on road bridges and the like which actually measure the number of traffic movements beneath and/or the average traffic speed. This information is recorded centrally and transmitted to road users equipped with dedicated receiving equipment.

Systems of the type just described suffer from the disadvantage that they are dependent on the installation and maintenance of a huge quantity of hardware, since the system can only operate on roads on which the necessary hardware has been installed. Also, the system can only be used by drivers whose vehicles are fitted with the necessary receiving equipment.

There has now been devised a method of traffic monitoring which overcomes or substantially mitigates the above-mentioned disadvantages.

According to the invention, a method of monitoring road traffic comprises monitoring the transitions of mobile telephones between cells of a cellular mobile telephone network and correlating said transitions to movement of road traffic along highways passing through said cells.

The method according to the invention is advantageous primarily in that it does not require the installation of dedicated hardware, either on the highways on which traffic flow is monitored or in vehicles travelling along those highways. Instead, the method takes advantage of the fact that a significant (and increasing) proportion of road users carry mobile telephones on board. These telephones are in constant dialogue with the mobile telephone

network which is "aware" of the particular cell to which each individual telephone is assigned at any particular moment in time. As a vehicle in which the telephone is carried travels along a highway, the telephone is "handed off" from one cell to another. The particular sequence of cells to which a telephone is assigned is characteristic of a particular highway. Thus, knowledge of the sequence of cells through which a particular telephone passes, or to which the telephone is assigned, gives information as to the route which that telephone is following, and the speed with which the telephone (and others following the same route) passes from one cell to another indicates the rate of traffic flow in that area.

According to another aspect of the invention, there is provided apparatus for monitoring road traffic, which apparatus comprises means for monitoring the transitions of mobile telephones between cells of a cellular mobile telephone network and means for correlating said transitions to movement of road traffic along highways passing through said cells.

As explained above, in a conventional cellular telephone system the network can be constantly "aware" of the particular cell to which an individual telephone is assigned at any particular time. Thus, information concerning a transition of a telephone from one cell to another is inherent in the system. The method and apparatus of the present invention thus utilise latent information, and the data handling technology by which such information can be processed and analysed will be readily apparent to those skilled in the art.

The invention will now be described in greater detail, by way of illustration only, with reference to the accompanying drawing which shows schematically a highway passing through a series of cells of a mobile telephone network.

Referring to the drawing, a highway (eg a major road or motorway) is designated 1 and follows a tortuous path which takes it through numerous cells (denoted AA,AB,... etc) of a mobile telephone network. Only those cells surrounding part of the highway 1 are shown, but in general cells will cover the whole length of the highway 1. The cells typically have diameters of from 1 to 7 miles or so.

A telephone carried in a motor vehicle travelling along the highway 1 from west to east as viewed in the drawing will be assigned initially to cell AA. However, as the vehicle travels further along the highway 1 the signal strengths vary and the telephone is handed on from cell to cell. In the case illustrated, the telephone is assigned to the sequence of cells shown at the right hand side of the drawing. This sequence is characteristic of traffic travelling west to east on the highway 1. Vehicles travelling in the opposite direction on the same highway would have the opposite sequence of cells.

Thus, at any particular instant, knowledge of the particular cell to which a telephone is assigned gives an indication of the geographical location of that telephone. Knowledge of the sequence of cells to which that telephone has been assigned indicates the route which on which that telephone is travelling. For instance, a telephone which is assigned to cell AE is located within that cell. If the telephone has a "history" of cells AA-BC-AC-AF-BB-AE then it is travelling west to east on highway 1. If the history is AB-CD-CA-CC-AB then the telephone is travelling east to west on highway 1. If the cell AE is preceded by CB then the telephone is not travelling on highway 1 at all, but on some other highway which can be identified by its own characteristic sequence of cells.

In practice, each telephone travelling along a particular highway may not be handed off through all of the possible characteristic cells for that highway. For instance, a telephone travelling west to east on highway 1 may be handed off from AA directly to AC and not BC. Assignment of a telephone to a particular route may therefore depend on assessment of probability, based on the number of "signature" cells through which the telephone passes.

The time taken for a particular telephone to pass through a cell gives an indication of the speed of traffic flow on the part of the highway which passes through that cell. Telephones on a particular highway entering a cell at a greater rate than they leave the cell is an indication of congestion on that route, within the cell. Similarly, telephones entering a cell and not leaving it is an indication of stationary traffic. This may be due to a traffic jam or to traffic congregating and stopping at, for instance, a sporting venue. However, the latter

case can be distinguished in that some traffic (that not attending the event) would still pass through the cell.

Allowance may also need to be made for telephones travelling by means other than by road, eg by train. Such circumstances may be recognised by relatively large numbers of telephones exhibiting simultaneous behaviour.

The information gathered by the method of the invention may be disseminated to road users in various ways. For example, users of the telephone system may place a call to either an automated information service or to an operator who will then be able to provide information as to the instantaneous whereabouts of the caller and the traffic conditions on the caller's route. Alternatively, such information may be disseminated continuously, at regular intervals, or in the event of a traffic jam being detected, for instance to other telephones approaching that jam. The information may also be relayed to, for example, radio stations for dissemination through broadcast traffic reports.

In a refinement of the invention, it may be possible to define one or more standard routes, ie routes along which a particular road user travels on regular or frequent occasions. This may be achieved by informing the system when that route is to be followed so that the route is stored for future reference. When the route is next to be travelled the user can then request from the system (eg by telephone or through a computer) a forecast of traffic conditions along that standard route.

Claims

1. A method of monitoring road traffic, which method comprises monitoring the transitions of mobile telephones between cells of a cellular mobile telephone network and correlating said transitions to movement of road traffic along highways passing through said cells.

2. A method as claimed in Claim 1, which method further comprises determining a sequence of cells through which a particular telephone passes or to which a particular telephone is assigned.

3. A method as claimed in Claim 2, wherein said sequence is compared with sequences characteristic of particular highways and thereby used to identify the highway along which the particular telephone is travelling.

4. A method as claimed in any preceding claim, further comprising the step of excluding from consideration telephones exhibiting behaviour characteristic of telephones travelling other than by road.

5. A method as claimed in Claim 4, wherein said behaviour is simultaneous transition of numerous telephones from one cell to another.

6. A method as claimed in any preceding claim, further comprising the dissemination of information regarding the movement of the road traffic to road users.

7. A method as claimed in Claim 6, wherein said dissemination if by means of information conveyed to said road users in response to telephone calls placed by said road users.

8. A method as claimed in Claim 6, wherein said dissemination is by means of

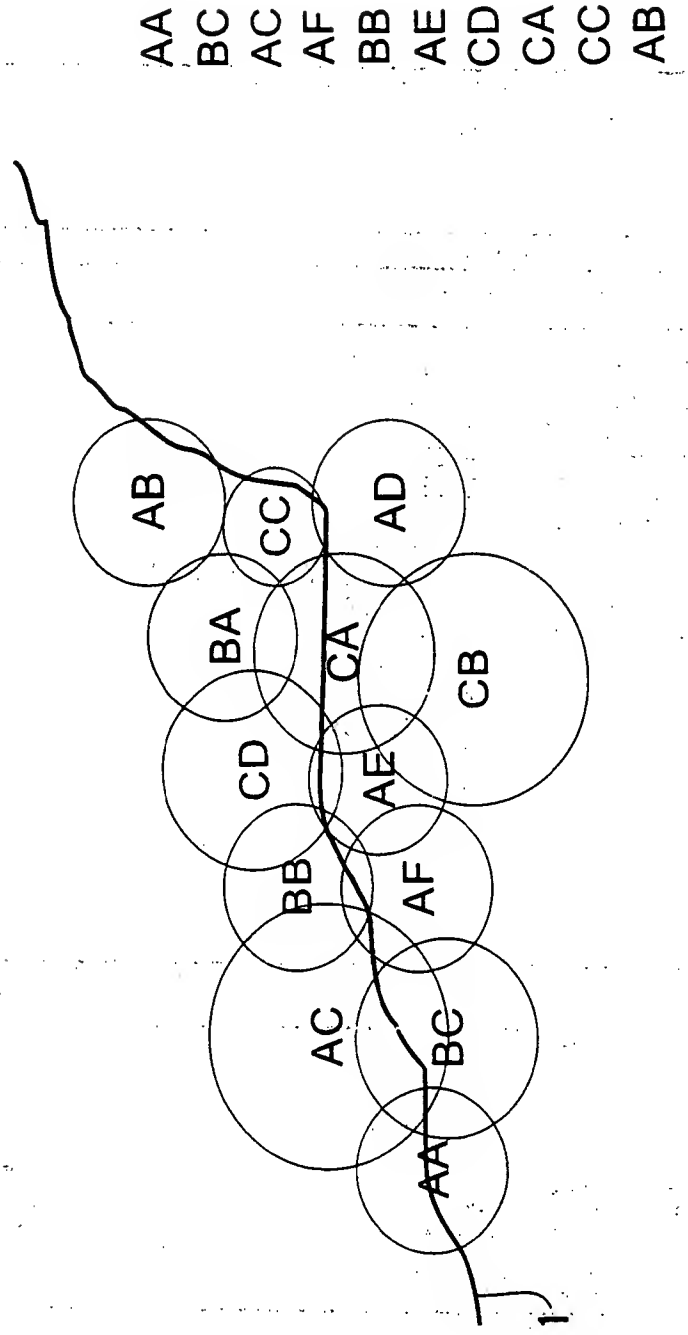
information transmitted continuously to the telephones of said road users.

9. A method as claimed in Claim 6, wherein said dissemination is by means of radio broadcast.

10. Apparatus for monitoring road traffic, which apparatus comprises means for monitoring the transitions of mobile telephones between cells of a cellular mobile telephone network and means for correlating said transitions to movement of road traffic along highways passing through said cells.

11. Apparatus as claimed in Claim 10, further comprising means for monitoring the sequence of cells of the cellular telephone network through which a particular telephone passes, or to which a particular telephone is assigned.

12. Apparatus as claimed in Claim 10 or Claim 11, further comprising means for disseminating information regarding the movement of road traffic to road users.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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G08G1/01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G08G H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y		8,9
X	DE 196 38 070 A (DEUTSCHE TELEKOM MOBIL) 19 March 1998 (1998-03-19) column 1, line 32-55	1-3,10, 11
X	US 5 559 864 A (KENNEDY JR JOSEPH P) 24 September 1996 (1996-09-24) column 4, line 29-39 column 6, line 8-12	1,6,7, 10,12

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA	Authorized officer
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Interr ial Application No
PCT/GB 00/02433

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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